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Cost of Producing Sheep on Western Oregon Farms

Agricultural Experiment Station
Oregon State Agricultural College
CORVALLIS

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SUMMARY

1. Farm ewes pay $10.00 per ton for hay, $30.00 per ton for grain, 8 percent on livestock investment, 40c per hour for labor, and rent for all pasture, when wool is worth 35c per pound and lambs 10c per pound.

2. The average annual cost of running farm sheep is $9.96 including interest and depreciation.

3. The useful life of the farm ewe averages six seasons.

4. Death loss in a well managed flock will average about 6 percent.

5. Ewes with broken mouths or spoiled udders are not profitable.

6. Lamb prices are usually highest in April and then decline until July.

7. Rams of the early maturing type are necessary to produce lambs that will mature and fatten before dry weather.

8. About 70 percent of the annual income from farm sheep is from the lambs and only 30 percent from the wool.

9. Sheep in Western Oregon require pasture to the greatest possible extent both for economy and for health and vitality.

10. The net cost of growing a yearling ewe from weaning to breeding age is $3.90. With market lambs worth $7.50 per head the total cost of the yearling ewe at breeding time would be $11.40.

11. Since the ewe lamb increases in value the first year, this year is as profitable as any other.

12. The annual cost of running pure-bred ewes is about $30.00 per head. The increase over the cost of running commercial sheep is due to the greater capital investment.

13. Pure-bred lambs at weaning cost the producer from $17.50 to $26.00 per head depending on the value of breeding stock used, including death loss, depreciation, and interest.

14. Sown pastures or irrigated pastures are expensive but are often necessary to produce good lambs.

15. Pure-bred lambs and yearlings cannot be pastured successfully on native sod during July and August.

Cost of Producing Sheep on Western Oregon Farms

By

Oran M. Nelson

This circular is a study of the financial side of the farm sheep industry of Western Oregon. The object is to show simple methods of estimating cost of production and to call attention to certain systems of management that will decrease the cost of production or increase the returns.

The figures have been obtained from the college flock of sheep and a few typical flocks in the Willamette Valley during a period of about ten years and will, it is believed, give a fair picture of the financial status of the farm sheep industry of Western Oregon. These figures will not, however, cover the extreme conditions frequently encountered.

There are two phases of the sheep industry found in Western Oregon. One is the production of commercial spring lambs for the butcher and the packer, and the other is the production of pure-bred rams for the commercial flocks of Western Oregon and for the range herds of Eastern Oregon. Since these two branches of the sheep business are quite separate and distinct, they are discussed separately.

PRODUCTION OF COMMERCIAL SPRING LAMBS

The production of commercial spring lambs is an industry well adapted to Western Oregon farms. By far the largest number of sheep found in Western Oregon belong to this class. Pure-bred rams are mated to grade ewes and the ewes are wintered as much as possible on grass. The lambs are dropped early in the spring and are grown, fattened, and marketed by May or June at weights ranging from 70 to 80 pounds.

A budget for farm sheep can be given in three different ways: A. The items of death loss and depreciation are charged against each ewe. B. Death loss and depreciation are taken care of by the actual purchase of yearling ewes for replacement each year. C. Ewe lambs are selected from the lamb crop and held over for replacement of death loss and depreciation. All other items of expenses are charged in the same manner for all three methods. The first method is usually expressed for convenience on the per-head basis, whereas the other two are usually expressed on the basis of flocks of a hundred head. All three of these methods are given in the accompanying table (see page 6), but the discussion which follows is based on the first method.

BUDGETS FOR COMMERCIAL FARM SHEEP

		Amount	Percentage of total
			%
A. Depreciation and death loss charged against each ewe.			
Expenses per ewe:			
Feed and pasture:			
1.25 acres native sod pasture at $2.00	$2.50		
.1 acre rape or rape and clover at $15.00 ($5.00 rent, $10.00 seed and labor)	1.50		
30 lbs. of hay at $10.00	.15		
30 lbs. of grain at 1½c	.45	$4.60	46.18
Interest, 8% of $8.32 (ave. life value of ewe)		.67	6.73
Labor, 4 hours at 40c		1.60	16.06
Shearing, packing, and marketing wool		.20	2.01
Ram service ($40.00 ram for 50 ewes)		.35	3.51
Housing charge (interest and depreciation)		.40	4.01
Taxes (average for Western Oregon)		.19	1.91
Miscellaneous (dip, salt, etc.)		.22	2.21
Expense exclusive of death loss and depreciation		$8.23	
Annual depreciation on ewe		1.23	12.35
Death loss on ewes, 6 % of $8.32		.50	5.02
Total annual expense		$9.96	100.00
Income per ewe:			
1 lamb, 75 lbs. at 10c		$7.50	72.82
1 fleece, 8 lbs. at 35c		2.80	27.18
Total annual income		$10.30	100.00
Balance		$0.34	
B. Ewe flock maintained by buying yearling ewes.			
Expenses per 100 ewes:			
Feed, pasture, interest, labor, shearing, ram service, housing, taxes and miscellaneous as in Budget A			$823.00
20 yearling ewes at $11.40			228.00
Total annual expense			$1051.00
Income per 100 ewes:			
100 lambs, 75 lbs. at 10c		$750.00	
800 lbs. wool at 35c		280.00	
14 cull ewes at $4.00		56.00	
Total annual income			$1086.00
Balance			35.00
C. Ewe flock maintained by holding over ewe lambs.			
Expenses per 100 ewes:			
Feed, pasture, interest, labor, shearing, ram service, housing, taxes, and miscellaneous as per Budget A			$823.00
Maintenance cost of 20 yearling ewes held over for breeding purposes at $6.83 per head as shown in the budget for a yearling ewe			136.60
Total annual expense			$959.60
Income per 100 ewes:			
Mutton:			
21 lambs not sold—no income			
79 lambs, 75 lbs. at 10c		$592.50	
14 cull ewes at $4.00		56.00	
Wool:			
800 lbs. wool at 35c		280.00	
20 lamb fleeces, 9 lbs. at 35c		63.00	
Total annual income			$991.50
Balance			*31.90

*This figure differs from the balance in budgets A and B only in the dropping of fractions. The number of ewe lambs not sold is given at 21, whereas the mathematically correct figure is 20.6.

EXPENSES

Systems of management are different and values are constantly changing. It is therefore impossible to give a table that will hold good for all times and conditions. Feed costs are not the same on all farms. Cost of labor and value of sheep, wool, and lambs fluctuate from year to year. Other figures can be inserted in the table to suit any particular flock.

In figuring the cost of operation, however, all the items listed above must be included. Too often such items as depreciation and interest on investment are left out. Capital invested in sheep, land, or buildings could be invested in other business that would make returns at prevailing rates of interest. The foregoing budgets give the relative importance of cost items and returns involved.

Fig. 1. Dead furrow. Losses of this sort are preventable by frequent observation of the flock.

Feed and pasture. This item will vary considerably depending on the farm, locality, and climatic conditions. Particularly is this the case in regard to the winter feeding. On some farms little or no hay and grain are fed, and the sheep winter entirely on waste land and native sod. On other farms, because of the limited amount of native sod, it is necessary to feed considerable quantities of hay and grain during the winter months.

Grazing is the cheapest feed and winter feeding should therefore be such as to get the most out of the native sod and waste land of the farm. The plan given in the table provides for a minimum amount of winter feeding. The hay is used only during the period when snow is on the ground, and the grain is fed during the time of lambing. In favorable years when the winter is mild and open, even this small amount of feeding may not be necessary and the cost of wintering will be correspondingly

less. On the other hand, there will be years when the grass is damaged by snow and freezing and it might be advisable to feed more hay and grain than the amount provided in the table. On the average, the amounts of hay and grain given in the table together with the pasture will bring the ewes through the winter in good shape.

In our feed budget no mention is made of grazing of fields after the harvesting of crops and of other odds and ends. On all farms there is considerable growth of vegetation that can be utilized in no other way than by stock grazing. It is hard to estimate the amounts and costs of feed of this type and the budget, therefore, was made up without considering it. Ordinarily pasture of this type is worth from one-half to one cent per sheep day, depending on the character of the feed produced. For information regarding yields of these kinds of pastures see the pasture discussion at the end of this circular.

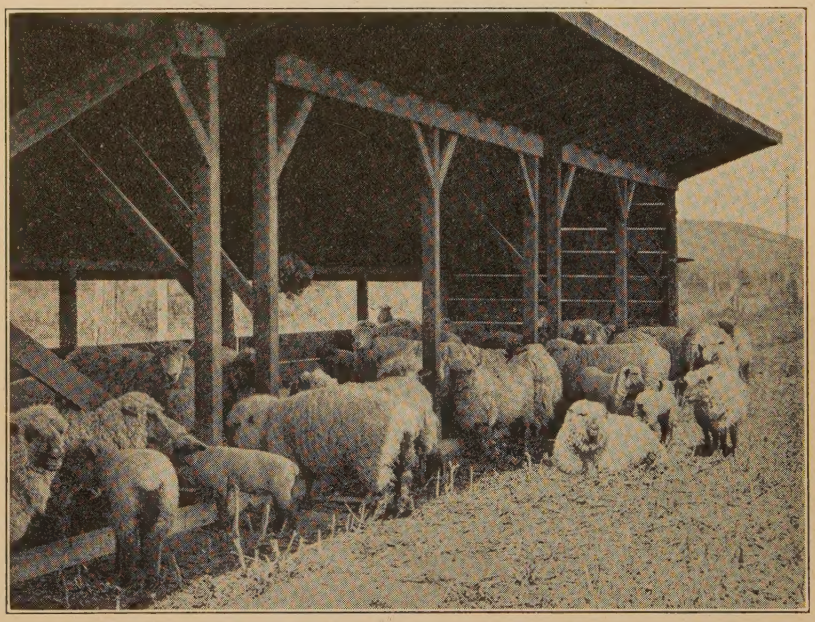


Fig. 2. The housing charge in a shed of this type is less than that indicated in this circular. This shed is portable and is excellent for summer shade.

The acre and a quarter of native sod allowed per ewe furnishes pasture for about nine or ten months of the year and is used from early fall until shortly after lambing and then again during the summer after the lambs have gone to market. The allotment of one and a quarter acres of this pasture assumes that hill land has a carrying capacity of 225 to 250 sheep days per acre. Such land can ordinarily be rented for $2.00 per acre. Native sod which has largely been taken by brush and timber or which is badly infested with moss, or which is found on flat, poorly-drained land of the type known as white land, would have a carrying capacity much less than this. In some cases it might be as low as 100 sheep days per acre. With

such land more than an acre and a quarter per head would be required, but the cost per head would be the same since this poorer land has a lower rental value per acre. Two dollars for 225 sheep days of pasture is nearly .9c per day, which is about all that native sod pasture is worth.

Where the amount of native sod is limited, it is sometimes necessary to feed more hay and grain to the ewe flock during the winter. On such farms the annual feed and pasture per ewe might be as follows:

¾ acre of native sod (carrying capacity 225 to 250 sheep days)	$1.50	
1/10 acre clover or rape pasture	1.50	
300 pounds hay at $10.00	1.50	
45 pounds grain at 1½c		.68
Total feed and pasture cost	$5.18	

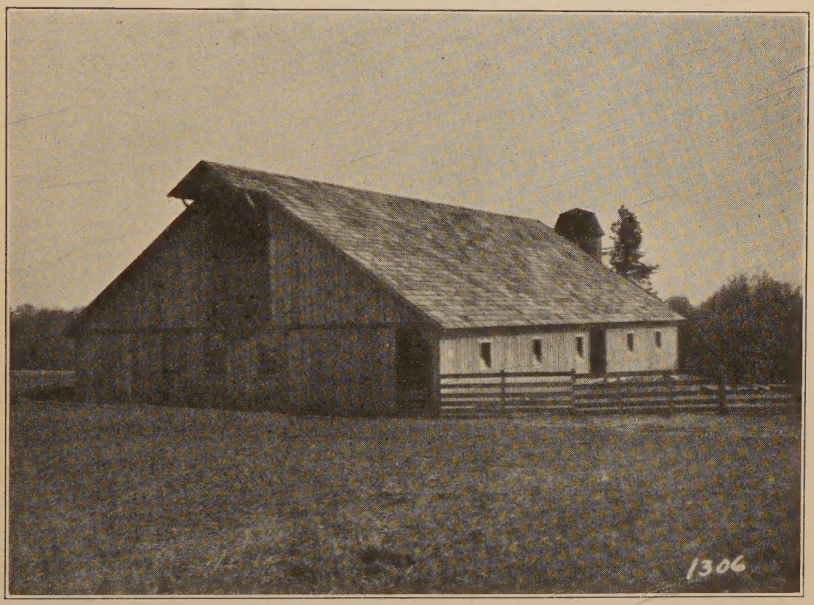
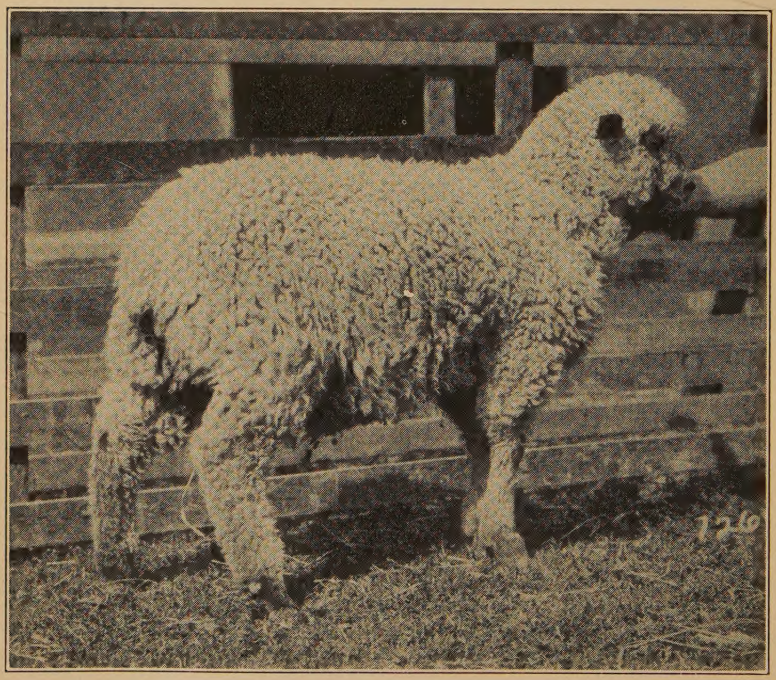


Fig. 3. Permanent sheep barn which provides storage space for feed.

It will be noted that the cost of feed under this plan is 58c higher than that given in the main table. The feeding of large amounts of hay and grain increases the costs of wintering and should therefore not be practiced unless the farm organization is such that it permits of only limited use of native sod. Winter feeding in any case should be such that it will get the most out of the native sod.

The tenth of an acre of clover or rape pasture is used to finish the lambs. The ewes and lambs go on to this pasture a month or two after lambing and stay there until weaning time, when the lambs go to market. This pasture also furnishes considerable feed for the ewes at breeding time.



Figs. 4 and 5. Returns from the farm ewe.

It is true that feed and pasture in some localities, because of high land values, cost much more than the figures quoted. Such high values, however, are based on other uses than sheep raising, and where such high values exist sheep raising is unprofitable and should not be encouraged. On land that is especially adapted to truck gardening, berries, fruit, or the production of fresh milk for the city trade, sheep raising is a questionable enterprise. On a very large proportion of Willamette Valley farms, however, a flock of sheep will produce at least as much income from the land as any other form of agriculture.

Fig. 6. Barren ewes become excessively fat. Such ewes should be sent to market.

Annual depreciation. The annual depreciation is based on a value of $11.40 for a yearling ewe and a cull value of $4.00 for the worn-out ewe at the end of six breeding seasons. The value of $11.40 for the yearling ewes is based on production cost rather than prevailing market values. The market value of breeding ewes fluctuates with demand for breeding stock and therefore is only temporary, but over a period of years the value of the yearling ewe must be the value of the lamb at weaning plus the net carrying cost of keeping the lamb until she is of breeding age. A table showing the cost of producing a yearling ewe is given later in this circular. Breeding ewes in Western Oregon if properly cared for will be good for an average of six breeding seasons. The annual depreciation would, therefore, be one-sixth the total depreciation of $7.40, or $1.23. It must be remembered that feed and care have a great effect on the length of life of a ewe. Ewes subjected to short feed and exposure depreciate faster than indicated in the table.

Interest and death loss. The interest charges and death loss are based on an average life value of $8.32, which is the figure obtained where the

life of the ewes is six breeding seasons and the annual depreciation is $1.23 and the yearling cost $11.40. The rate of interest is 8 percent, which is the standard bank rate in most localities. The maximum death loss should not exceed 6 percent and in well managed flocks under favorable conditions it may be as low as 3 percent. Lack of feed, exposure, ditches, dogs, fly blow, disease, old ewes with broken mouths, and neglect at lambing time are all factors which tend to increase the death loss. On the other hand, death losses cannot be entirely eliminated and always form a substantial item in the budget. In any flock the heaviest death loss comes

Fig. 7. Pure-bred Hampshire ewes.

during lambing. The previous winter management has a great effect on troubles at lambing time. Narrow doorways which cause much crowding of the ewes are responsible for many twisted or wrongly presented lambs. Dogs are responsible for other such lambs. Extra care at lambing time helps greatly in decreasing losses and increasing the lamb returns.

Labor. The labor charge is based on a flock of 100 breeding ewes. In a flock of 25 ewes, the amount of labor would be slightly more per head. The item of labor includes all handling of the sheep except the operation of shearing. Observation of sheep while one is working in an adjacent field or about the barn lot is not included.

Shearing, packing, and marketing wool. The 20c allowed for this item includes 15c for shearing, 2¼c for the sack, ¾c for the wool string, and 2c for the labor of sacking and hauling to the local shipping point. The 15c allowed for shearing is the standard price. The charge for the sack assumes that a sack costing 75c will hold from 250 to 300 pounds of wool. The string charge is based on string costing 30c per pound and yielding 40 strings to the pound.

Ram service. The cost of ram service in flocks of 30 to 70 ewes per ram is shown in Table I for rams costing from $25 to $50 per head as year-

lings. In each instance the useful life of the ram is taken as four breeding seasons. His mutton value at the end of this time is counted as $5.00.

TABLE I. COST OF RAM SERVICE

Yearling rams costing	$25.00	$30.00	$35.00	$40.00	$45.00	$50.00
Annual cost items:						
Interest on average life value at 8%	$1.40	$ 1.65	$ 1.90	$ 2.15	$ 2.40	$ 2.65
Annual depreciation	5.00	6.25	7.50	8.75	10.00	11.25
Loss by death 6%	1.05	1.24	1.43	1.61	1.80	1.99
Labor	2.00	2.00	2.00	2.00	2.00	2.00
Pasture charges	2.50	2.50	2.50	2.50	2.50	2.50
Hay 400 lbs. at $10.00 per ton	2.00	2.00	2.00	2.00	2.00	2.00
Grain 60 pounds at 1½c	.90	.90	.90	.90	.90	.90
Shearing and marketing wool	.25	.25	.25	.25	.25	.25
*Taxes	.19	.19	.19	.19	.19	.19
Housing charge	.50	.50	.50	.50	.50	.50
Miscellaneous	.22	.22	.22	.22	.22	.22
Total annual cost per ram	$16.01	$17.70	$19.39	$21.07	$22.76	$24.45
Income:						
†1 fleece, 10 lbs. at 35c	3.50	3.50	3.50	3.50	3.50	3.50
Net annual cost per ram	$12.51	$14.20	$15.89	$17.57	$19.26	$20.95
Cost of ram service per ewe:						
30 ewes per ram	.417	.473	.530	.586	.642	.698
40 ewes per ram	.313	.355	.397	.439	.482	.524
50 ewes per ram	.250	.284	.318	.351	.375	.419
60 ewes per ram	.209	.237	.265	.293	.321	.349
70 ewes per ram	.179	.203	.227	.251	.275	.299

*Taxes for these rams are the same as grade sheep, since pure-bred rams in grade flocks are usually assessed at the same rate as the ewes.

†The fleece for each ram is 10 pounds. This is not strictly correct, as the cheaper rams would undoubtedly shear less than the better rams. Just how much less, it would be difficult to say.

A study of Table I will show that there are two ways of reducing the ram costs. One is by using cheaper rams and the other is by increasing the number of ewes allotted to each ram. Either one of these methods can very easily be overdone; particularly is this true regarding the use of cheap rams. The lowest-priced ram given in the table is $25.00, and in the discussion of the cost of producing pure-bred rams given in another part of this circular it will be seen that this is the average price that the producer of rams must have in order to break even. Ten- and fifteen-dollar rams are, therefore, inferior and produce inferior lambs. Each additional $5.00 paid on the purchase price of a yearling ram means an increase in cost of ram service of only 3.4c per head in a flock of fifty ewes. Looking at it this way, one can see the folly of using cheap, inferior rams. An average of one pound additional weight of the lamb at marketing time will offset an additional $15.00 in the cost of the ram. A good ram worth $50.00 may in the long run be more profitable than one worth $25.00.

Forty to sixty ewes is the number usually allotted per ram. There are instances of successful breeding where 75 or even 100 ewes have been bred to one ram. More than 60 ewes is a heavy load for one ram and unless he is on exceptionally good feed he will run down in flesh very much. Too many ewes allotted per ram may lower the lambing percentage. Increasing the number of ewes lowers the cost of ram service per ewe but the difference is insignificant after we pass 60 head. A study of Table I shows that

for a $50.00 ram the decrease in the cost of ram service by increasing the flock from

30 to 40 ewes is 17 cents per head.
40 to 50 ewes is 10 cents per head.
50 to 60 ewes is 7 cents per head.
60 to 70 ewes is 5 cents per head.

Increasing the number of ewes beyond 60 lowers the cost of ram service per ewe so little that it is hardly advisable to use more than 60 ewes per ram, especially when there is any danger of lowering the breeding efficiency of the flock. Thirty ewes is the minimum number for which a good ram can be kept; below 30 the cost of ram service becomes excessive.

Fig. 8. Ram lambs at weaning time cost the producer about $20.00 per head, depending on the value of breeding stock used.

With a reasonable number of ewes it will be seen that the cost of ram service is not one of the large items. It forms only slightly more than 3½ percent of the total annual expense. The important thing in connection with this item is to use rams of the early maturing type which will produce lambs that will mature and fatten before the dry weather begins. Type and quality are usually more of a factor than price.

Housing charge. Forty cents provides for interest, depreciation, taxes, and insurance on a total shed or barn investment of $2.40 per head, which with simple construction and rough lumber will provide 15 to 20 square feet of floor space for each ewe.

Taxes. Commercial sheep are in most counties assessed at $5.00 per head. The levy in Western Oregon counties ranges from 26 to 55 mills with an average of 38 mills, which figure applied to the assessment of $5.00 gives an average tax of 19c per head.

Miscellaneous items. Included in these items are such things as salt, dip, and medicine necessary in the care of a flock of sheep.

INCOME

Lamb income. The lamb income is based on one lamb weighing 75 pounds per head by the middle of June for each ewe bred. Lambs held longer than June cost more to produce as they have to be carried into the dry season and do not fatten readily unless special pasture or feed is provided. Also, there is usually a very marked drop in the market price of lambs about the middle of June owing to the competition of Eastern Oregon range lambs. In order to get these early lambs the ewes must be bred as early in the fall as they will take the ram, which is about Septem-

Fig. 9. Champion Shropshire ewe at the Pacific International Livestock Exposition 1922. Bred and fitted by Oregon State Agricultural College. Ewes of this quality are not used for the production of range rams but rather for the production of stud sheep.

ber 1. Most ewes will not breed that early unless they are on good feed. Good feed at breeding time not only brings the ewes more strongly in heat, but also increases the number of twins and triplets. Experiments of the United States Department of Agriculture have shown that the number of lambs dropped has been increased 25 percent owing to flushing (good feed) at breeding time. Rams known to be somewhat irregular in breeding should never be used; the risk is too great. Ewes that fail to breed regularly should be marked so they can be disposed of later. A good practice is to notch the ear of a ewe each time she fails to breed. A regular breeding ewe may miss a season but all ewes missing two seasons should be sold to the butcher. It should be noted that a 100-percent lamb crop at marketing time means distinctly more than 100 percent at lambing time.

Aside from parasites and disease, the quality and condition of the lamb depends on his inheritance and feed. Lambs of the slow-maturing type are rarely ready before the dry weather and must be carried over until fall or winter. This requires considerable additional pasture and feed and usually means a smaller profit if not a loss. Not only must the lambs be bred right but the ewes and lambs must always run on the best of pastures. Clover and rape pastures are perhaps the best for finishing lambs. On pastures of this type the ewes milk better and the lambs eat considerable feed in addition to their mothers' milk. Native sod is not particularly good for finishing lambs as it begins to dry just at the time that the lambs require the most feed. A test at the Corvallis Station comparing clover pasture with native sod for finishing lambs showed that the lambs on clover pasture gained 39 percent more than those on native sod. All of

Fig. 10. Native sod pasture yields on the average 250 sheep days per acre. Western Oregon has thousands of acres of this type of pasture.

the lambs on the clover pasture were fat and ready for market by June 1, whereas 26.6 percent of those on the native sod were not ready for market but had to be held for a longer time and sold on a lower market. In the absence of good finishing pastures it might be well to feed grain to the lambs in a creep. A creep to be of any value should be located at the place where the ewes bed. Lambs early in life begin to eat grain and often will consume as much as a pound or more per day if the creep is conveniently placed. Since lambs to be ready for market must be fat, it is better to feed grain than to sell them thin or to hold them over the summer.

Wool income. Wool income is affected by the breeding and age of the ewe flock, and the feed and care throughout the year. The use of high-shearing rams and the rigid culling of low-shearing and old ewes greatly increases the average fleece weights of the flock. Demonstrations along this line by the Extension Service of Oregon State Agricultural College have shown that fleece averages of a flock can be increased a pound and a half in the short period of two or three years. The use of scales at shear-

ing time is highly recommended. Feeding has a marked effect on the weight and quality of the fleece. Scant feed or sudden changes in amounts or quality of feed will invariably produce weak places in the wool fiber which lower its value. In many such cases the ewe may shed a large part of her fleece. Old ewes are usually not good producers of wool. Their fleeces are light and are easily weakened by illness, lack of feed, or exposure. A good shearing flock of ewes is made up of young ewes well bred and well fed.

BUDGET SUMMARY

The budgets given show that with yearling ewes worth $11.40, a 100-percent lamb crop, an 8-pound wool clip, and with lambs selling at 10c and wool worth 35c per pound, the flock of farm ewes should return to the

Fig. 11. Volunteer sod has a carrying capacity only equal to native sod. Such fields would yield from two to four times as much pasture if properly seeded to a suitable grass mixture.

farmer $10.00 a ton for hay, $30.00 a ton for grain, 8 percent on investment, 40c per hour for labor, $4.00 rent for pasture and 34c per head additional. Where the ewes are owned outright, and the farmer does his own work, produces his feed and owns his pasture, all of the items listed above will come into his pocket. On the other hand, ewes purchased on borrowed capital, fed on purchased feed and rented pasture, and cared for by hired labor will return only 35c per head. While there are many farm flocks which do much better than the figures shown in this table, there are flocks which do not do as well. On the average, conditions are about as shown in the table. It must be remembered that a flock of commercial ewes makes the foregoing returns only under the conditions cited. There are several factors such as lambing percentage, weights of finished lambs, fleece

weights, value of ewes, market prices, etc., that may make the returns quite different from those quoted.

With lambs worth 10c per pound each additional percent in the lamb crop means 7½c additional income per ewe. On this basis a 90-percent lamb crop would fall 40c short of paying for feed, labor, and interest on livestock investment. Likewise, a 70-pound average per lamb instead of 75 pounds would fall 15c short. With wool worth 35c per pound and with a 7-pound clip instead of an 8-pound clip the ewe will just pay for feed, labor, and interest.

The value of the breeding flock also affects the annual cost of running sheep and thereby the profit. The budget items affected are interest, death loss, and depreciation. In this connection it is interesting to note that each dollar increase in the investment per ewe increases the annual running cost 43c. It is quite evident that with wool worth 35c per pound and lambs at 10c one cannot operate to an advantage with stock valued much higher than $8.32 average value. Usually as the price of wool and lambs goes up the value of breeding stock increases. Table II indicates the prices per head that the farmer can pay for breeding stock as wool and lamb prices increase and still make about the returns per head indicated by the budget.

TABLE II. RELATION OF VALUE OF BREEDING STOCK TO MARKET PRICES OF WOOL AND LAMBS

Value of breeding stock Average all ages	Yearly average market prices per pound	
	Wool	Lambs
$ 8.32	.35	.10
9.32	.36	.105
10.32	.365	.11
11.32	.37	.115
12.32	.375	.12
13.32	.38	.125
14.32	.385	.13
15.32	.39	.135

The relation between breeding value of stock and market prices given in Table II is about as it exists in actual conditions. Of course, the prices of wool and lambs do not fluctuate with the regularity indicated by the table. There may be years when lambs increase or decrease more rapidly than wool or vice versa. Whenever the combined return of wool and lambs increases or decreases 40c to 45c, however, there usually is an increase or decrease of $1.00 per head in the average value per head of breeding stock.

Too often the farmer figures that interest is all that he has to have on his additional investment, forgetting that some of the high-priced ewes will die and that all will have to go as cull mutton in a few years.

The number of seasons which breeding ewes are used before being discarded has an effect on depreciation, death loss, and interest. Where ewes are used only five seasons instead of six these items are increased 26c, and where ewes are used four seasons instead of five these items are increased 40c. In other words, with yearling ewes worth $11.40 per head and the cull value at $4.00 per head, it costs 26c more annually to run each ewe in a flock where the life of the ewe is five seasons instead of six and it costs 40c more in a flock where the life of the ewe is four seasons instead of five.

TABLE III. COST OF PRODUCING A GRADE YEARLING EWE

Interest on lamb cost, 8% of $7.50 for 14 months		$ 0.70
Death loss, 3% of $7.50		.22
Labor, 3 hours at 40c		.80
Shearing, packing, and marketing wool		.20
Feed and pasture:		
.1 acre rape or rape and clover (after weaning)	$1.50	
¾ acre native sod at $2.00	1.50	
Winter feed 100 lbs. hay at $10.00	.50	
½ lb. grain for 120 days, 60 lbs. at 1½c	.90	
Total feed and pasture		4.40
Taxes		.19
Housing and equipment		.34
Miscellaneous (dip, salt, etc.)		.20
Total cost		$ 7.05
Income from wool 9 lbs. at 35c		3.15
Net carrying cost for one year		3.90
Lamb cost		7.50
Total cost of yearling ewe		$11.40

The items of Table III do not require explanation since for the most part they are the same as those given in the first table of this circular.

For several years, yearling ewes have been selling at figures quite a bit higher than production costs. The ewe lamb appreciates in value; in fact she more than pays interest on investment and for farm feed and labor at market price. Beginners can often do as well the first year by starting with ewe lambs as with ewes of breeding age.

PRODUCTION OF PURE-BRED SHEEP

Western Oregon has long been a breeding ground for pure-bred Lincoln, Cotswold, and Shropshire sheep. In recent years there has been much interest in the breeding of Hampshires, Oxfords, and Romneys. Pure-bred sheep of other breeds are also found in Western Oregon, but they are not found in as large numbers as the breeds mentioned above, and they do not play a great part in the ram trade of Western Oregon.

There are two fields open to the ram trade: one is the production of range rams for Eastern Oregon, and the other is the production of rams for the farm flocks of Western Oregon. Because of the system of breeding on the range, the demand for rams fluctuates greatly between the fine-wool, medium-wool, and long-wool types. The fine-wool sheep, because of inherited flocking propensities, are the backbone of the range-sheep industry, and with the present system of management range sheep will always have a considerable percentage of fine-wool blood. Sheep highly bred along these fine-wool lines are good producers of wool but are less satisfactory from the standpoint of mutton production. For these reasons rams of either the medium-wool or the long-wool type are used on ewes of fine breeding. Continued breeding to rams of the long- or medium-wool type is not desirable as ewes of this breeding will not flock as do the fine wool ewes. The use of fine-wool rams is, therefore, again necessary to bring

back the flocking qualities. The demand for rams of the types mentioned depends to a great extent on the relative prices of wool and mutton. When wool is high, there is a much greater tendency toward the use of fine-wool rams, while when mutton is high rams of the medium and long-wool types are used more extensively. The demand for range sires of the long-wool type seems to vary to a greater degree than the demand for sires of the medium-wool type. Of the medium- and long-wool types, the Lincolns and the Hampshires have been used to the greatest extent as sires for range sheep. In the past, Lincoln, Cotswold, and Shropshire rams have been used quite generally as sires for farm flocks of sheep. The use of Hampshire, Oxford, and Romney rams on farm flocks in recent years has increased greatly. This is especially true regarding the Hampshire. The farm demand for rams of the various breeds is largely local.

Fig. 12. Rape pasture furnishes succulent feed during the dry summer months. Good rape pastures will yield as high as 1000 sheep days per acre.

The raising of pure-bred sheep differs from the raising of commercial sheep mainly in the capital required, feeding, and marketing of the stock produced. The increase in capital required for the raising of pure-bred sheep would in the main be the capital invested in the stock. No great amount of capital need be tied up in buildings and equipment that would not be required for the commercial sheep raising. The capital invested in livestock will vary considerably depending on the breed and excellency of stock used. Pure-bred sheep of popular breeds will cost two to three times as much as stock of similar quality but of a breed for which there is no demand. The amount of money invested per head in pure-bred sheep will ordinarily run two and three times as much as that invested per head in grade or commercial sheep.

The pure-bred sheep industry requires more liberal feeding than does the commercial sheep industry. The pure-bred breeding ewes do not need much more feed than grade ewes, but it is the young growing stock that requires the special attention. In commercial lamb production, the lambs go directly to market from the ewes and the ewes do very well on dry pasture. Pure-bred lambs are never marketed until the following fall and most of them are held over until yearlings. This means that they must be carried through one and usually two dry seasons. Special pastures such as

rape, clover, or rape and clover must be provided for these dry periods. In case the offspring are to be marketed as yearlings instead of as lambs, considerable grain must be fed during the first winter. Prices received for pure-bred rams and ewes are to a great degree directly proportional to the development which they have made.

The success with pure-bred sheep depends to a great degree on the salesmanship of the producer. The marketing of the spring lambs is well worked out and comparatively simple, but not so with pure-bred sheep. The producer of pure-bred sheep must go out and look for his buyer if he is to get the most out of his livestock. It is one thing to have good stock for sale and another to have it generally known. Some advertising is therefore required.

Fig. 13. Clover pasture is excellent for growing stock. Like rape, it is a good summer pasture.

Since there is much variation in the excellence of stock, the producer of pure-bred stock must be a good judge. He must recognize the exceptional animal and place a price on it high enough to get all that the trade will stand and yet not interfere with ready sale. There are also in every flock animals which, because of lack of excellence, must sell for less than production costs or be sent to the butcher. The better animals must therefore sell for prices which will make up the losses incurred on the poorer animals.

A question often asked is: Which pays the more, the commercial sheep industry or the production of pure-bred sheep? This question is a difficult one and one impossible to answer for general conditions. The two fields, though similar, are after all quite different. Choice of one or the other depends to the greatest extent on the farmer himself rather than the farm or equipment. The pure-bred sheep industry does require, however, more tillable land for the production of feed for the growing stock than the commercial industry. In general, it is better for the beginner to start with grade sheep. The capital required is much less and mistakes consequently less expensive. After one has been successful with a grade flock he can

change to pure-bred if the pure-bred industry appeals to him most. The pure-bred business looks better on paper but it requires much skill and judgment to produce sheep that will sell at pure-bred prices.

TABLE IV. COST OF PRODUCING PURE-BRED SHEEP TO THE AGE OF SIX MONTHS

		Amount	Percentage of total expense
			%
Expenses per ewe:			
Interest at 8% on average value of ewe		$ 1.54	7.39
Depreciation on ewe		4.33	20.77
Loss by death of ewes 6%		1.15	5.52
Labor, 8 hours at 50c		4.00	19.18
Shearing, packing, and marketing wool		.20	.96
Ram service (flock of 50 ewes)		.76	3.64
Taxes		.27	1.29
Housing		.40	1.92
Miscellaneous (dip, registration, salt, etc.)		1.00	4.80
Feed and pasture:			
1 acre hill pasture at $2	$ 2.00		
.1 acre clover pasture	1.50		
.1 acre rape pasture	1.50		
200 lbs. hay at $10 per ton	1.00		
80 pounds grain at 1½c	1.20	7.20	34.53
Total annual expense per ewe		$20.85	100.00
Receipts per ewe:			
8 pounds wool at 35c per pound		2.80	
Net cost of pure-bred lamb at six months of age		$18.05	

The method of figuring the several cost items for production of pure-bred lambs is much the same as that for the production of the commercial lambs. It might therefore be well for the reader to be thoroughly familiar with the discussion of the cost items given for the production of commercial lambs. In this part, only those items materially different will be discussed.

Depreciation, interest, and death loss. Depreciation is figured on six breeding seasons using $30.00 as the value of the yearling and $4.00 as the cull value of the worn-out ewe. The total depreciation would in this case be $26.00 and the annual depreciation $4.33.

Interest and death loss are figured on the average life value of $19.17 based on an annual depreciation of $4.33.

Labor. The labor is figured on the basis of a flock of 100 ewes. The time allotted per ewe is twice that for commercial sheep. The extra time is for special care given the lambs and for the time necessary for ear tagging, keeping records, and for registration. Because of the larger amount of capital invested, pure-bred sheep are ordinarily watched much closer than the commercial or grade sheep. The rate of wages used for pure-bred sheep is higher because of the greater responsibility owing to the larger capital investment.

Ram service. The cost of ram service in pure-bred flocks of 30 to 80 ewes per ram is shown in Table V for rams costing from $50.00 to $200.00 per head as yearlings. In each instance the useful life of the ram is taken as four breeding seasons and his mutton value at the end of this time as $5.00.

TABLE V. COST OF RAM SERVICE IN PURE-BRED FLOCKS

Yearling rams costing	$50.00	$75.00	$100.00	$125.00	$150.00	$175.00	$200.00
Annual cost items:							
Interest on average life value at 8%	$ 2.65	$ 3.90	$ 5.15	$ 6.40	$ 7.65	$ 8.90	$10.15
Annual depreciation	11.25	17.50	23.75	30.00	36.25	42.50	48.75
Loss by death 6%	1.99	2.93	3.86	4.80	5.74	6.68	7.61
Labor	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Pasture charges	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Hay, 400 lbs. at $10.00 per ton	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Grain, 60 lbs. at 1½c	.90	.90	.90	.90	.90	.90	.90
Shearing and marketing wool	.25	.25	.25	.25	.25	.25	.25
Taxes	.27	.27	.27	.27	.27	.27	.27
Housing charge	.50	.50	.50	.50	.50	.50	.50
Miscellaneous	.22	.22	.22	.22	.22	.22	.22
Total annual cost per ram	$24.53	$32.97	$41.40	$49.84	$58.28	$66.72	$75.15
Income:							
1 fleece, 10 lbs. at 35c	3.50	3.50	3.50	3.50	3.50	3.50	3.50
	$21.03	$29.47	$37.90	$46.34	$54.78	$63.22	$71.65
Cost of ram service per ewe:							
30 ewes per ram	.701	.982	1.263	1.545	1.826	2.107	2.388
40 ewes per ram	.526	.737	.948	1.159	1.370	1.581	1.791
50 ewes per ram	.421	.589	.758	.927	1.096	1.264	1.433
60 ewes per ram	.351	.491	.632	.772	.913	1.054	1.194
70 ewes per ram	.300	.421	.541	.662	.783	.903	1.024
80 ewes per ram	.263	.368	.474	.579	.685	.790	.896

The cost of ram service given in Table V is 76c, which is cost of using a ram valued as a yearling at $100 on 50 ewes. As was pointed out in the discussion of ram service for grade ewes, there are two ways of lowering the cost of ram service: namely, increasing the number of ewes, or using cheaper rams. Forty to sixty ewes is the usual allotment per ram, although some rams will handle more than this number. It is quite customary to use rams which are much better than the ewes to which they are bred. In the production of pure-bred rams for the range or commercial trade, it is not uncommon to use rams costing as yearlings $75 to $125 on ewes of the quality and value of those used in this discussion.

Taxes. The taxes on pure-bred sheep are higher than those for grade sheep because of a difference in the assessed values of the two classes of sheep. In most counties of Western Oregon, the assessed valuation of pure-bred sheep is $7 per head and that of grade sheep $5 per head.

Miscellaneous. Of the item $1.00 for miscellaneous, 50c is for registration fee, and the remainder is for salt, dip, and medicines necessary for the care of a flock of sheep.

Feed and pasture. It is rather difficult to give a plan of pastures and feeding which will hold good for all farms and conditions. The plan given in the table, however, is quite typical of systems generally used by breeders of pure-bred sheep. The hill pasture, the hay, and the grain are intended for the breeding ewe from breeding time until a month or so after lambing. The clover pasture is used in the spring by the ewe and lamb until weaning time. After weaning the lambs graze on the rape pasture and what is left of the clover pasture. The use of annual cultivated pastures such as clover and rape during the late spring and summer is most essential in the pure-bred sheep industry. Ram lambs do not develop properly on dry native sod. Internal parasites such as stomach-worms and lung-worms are much

more easily controlled on annual pasture than on native sod. In the production of pure-bred sheep, it is essential that the growing stock be kept free of internal parasites. The ewes after weaning graze on the hay and grain stubble and such odds and ends about the farm, on which it is difficult to place a value. As in the case of the grade sheep industry, where the native sod hill pastures are limited it is necessary to provide more liberal winter feeding of hay and grain.

Receipts. The only item listed as receipts in the table is one fleece weighing eight pounds. The weight per fleece will depend on the breed and excellency of the sheep used. Long-wool sheep ordinarily shear heavier fleeces than the medium-wool sheep or the fleece used in the table. Ordinarily the price per pound for long wool is somewhat less than that for medium wool. On the average, the value of the fleece will be very close to the figure used. In flocks shearing a heavy fleece average, the cost of producing a pure-bred lamb will be less than it is in flocks having a low fleece average.

Net cost of the lamb. The net cost of the lamb at six months is obtained by subtracting the fleece value from the gross expenses of the year. Based on the cost of items used in the table, the net cost of the lamb is $18.05 in a flock using a $100 yearling ram on $30 yearling ewes, or stock of equal quality, and where the lambing percentage is 100 percent based on the number of ewes bred the previous fall.

Lambing percentage is one of the most important factors in determining the lamb cost. The cost of maintaining a breeding flock is nearly the same in a flock having a 50-percent lamb crop as one having 150 percent. With a lambing percentage of 150, the cost of the lamb at weaning would be approximately one-third the figure for a flock with a lambing percentage of only 50. The following table shows the probable lamb costs in flocks where the lambing percentage ranges from 50 to 150 percent.

EFFECT OF LAMBING PERCENTAGE ON LAMB COST AT SIX MONTHS AGE

Lambing percent	Cost of lamb
50	$36.10
75	24.07
100	18.05
125	14.44
150	12.03

The cost of pure-bred lambs is also affected by the value of the breeding stock used, as will be seen in Table VI.

TABLE VI. COST OF PURE-BRED LAMB AT SIX MONTHS OF AGE

Value of ewes as yearlings	Value of sires as yearlings						
	$50.00	$75.00	$100.00	$125.00	$150.00	$175.00	$200.00
$30.00	$17.71	$17.88	$18.05	$18.22	$18.39	$18.55	$18.72
40.00	20.19	20.36	20.53	20.70	20.97	21.02	21.20
50.00	22.68	22.85	23.02	23.19	23.36	23.52	23.69
60.00	.....	25.32	25.59	25.66	25.83	25.99	26.16

The maximum value of ewes used for producing the rams for the general ram trade is perhaps $60. Ewes of values ranging from $70.00 up are used for the production of fancy stud stock.

It is interesting to note what a small effect the sire investment has on the ultimate cost of the lamb. Each additional $25.00 investment increases

the lamb cost only 17c per head. The ewe investment has a more marked effect on lamb costs. Each additional $25.00 investment per head in the ewes increases the cost per lamb $6.20. These figures indicate that improvement in a flock can be brought about for much less cost through investment in better sires than in better ewes. A producer of rams should be very particular about the sires which he uses.

The figures in the foregoing table are based on a 100-percent lamb crop. To find the cost per head of lambs where the lambing percent is other than one hundred, merely divide the figure given for the class of stock used by the lambing percentage.

Many producers of rams make a practice of selling their rams as yearlings. In determining the cost of the yearling ram, the net carrying cost for a period of approximately fourteen months must be added to the lamb cost. The carrying costs would of course vary in different localities but Table VII indicates about what they might be.

TABLE VII. COST OF GROWING A PURE-BRED YEARLING

Interest on $18.05 at 8% for 14 months		$1.69
Death loss, 5% for 14 months		1.05
Labor, 6 hrs at 50c		3.00
Shearing and marketing wool		.20
Taxes		.27
Housing		.40
Miscellaneous (dip, salt, and advertising)		.60
Feed and pasture:		
.5 acre hill pasture	$1.50	
.1 acre clover pasture	1.50	
.1 acre rape pasture	1.50	
120 lbs. grain at 1½c	1.80	
200 lbs. hay at $10.00	1.00	7.30
Total		$14.52
9 pounds wool at 35c		3.15
Net carrying cost		11.37
Lamb cost		18.05
Total cost of yearling in September		$29.42

The method of figuring the carrying cost for the weaned lamb until he is of serviceable age is similar to that used in the cost determination of other classes of stock. Many of the items are identically the same as those listed for the running of pure-bred ewes. No depreciation is charged in the cost of growing pure-bred yearlings since this class of stock appreciates in value instead of depreciating. A study of the table shows that the heaviest item in growing a lamb to a yearling is that of feed and pasture. This item forms 55.6 percent of the total cost of growing the yearling and is 22.7 percent higher than the cost of feed and pasture for pure-bred breeding ewes. Since yearling rams sell on the basis of the development which they have made, they should be fed so as to make the maximum development during their growing period. The use of cultivated pastures such as rape or clover is essential in the growing of the pure-bred yearling. In developing the pure-bred yearling, it is necessary to carry the individual lamb through two dry seasons. This cannot be done on grass or permanent pasture since these pastures yield little or no feed during the months of July and August. Permanent grass pastures are apt to be badly infested with internal parasites such as stomach-worms and lung-worms. Lambs which have become infested with these parasites do not winter well but

come out of winter quarters in a thin, undeveloped condition. Where lambs go on to fresh cultivated pasture after weaning, the danger from internal parasites is reduced materially.

Table VIII gives the total aggregate cost of pure-bred yearlings at the beginning of the breeding season where sires ranging from $50.00 to $200.00 are used on ewes valued as yearlings from $30.00 to $60.00 per head.

TABLE VIII. COST OF PURE-BRED YEARLING RAMS READY FOR SERVICE

Yearling value of breeding ewes	Value of sires as yearlings						
	$50.00	$75.00	$100.00	$125.00	$150.00	$175.00	$200.00
$30.00	$29.02	$28.22	$29.42	$29.61	$29.81	$30.00	$30.20
40.00	31.88	32.08	32.27	32.48	32.66	32.86	33.06
50.00	34.74	34.94	35.14	35.34	35.53	35.73	35.92
60.00	.....	37.78	37.98	38.18	38.38	38.57	38.77

Table VIII shows the figures at which the yearling can be sold and still pay all expenses including feed, labor, and interest on livestock investment. To the inexperienced sheepman it might seem that there is

Fig. 14. Alfalfa pasture yields very heavily but, because of bloat, losses on this pasture are very great.

considerable money in pure-bred sheep. One might infer that by using a $150 ram on $50 ewes it would cost only $35.53 to produce a yearling that could be sold at from $50 to $150 per head. This is not the case. Even when mated to a $150 ram $50 ewes do not produce all $50 yearlings. All highly selected strains of livestock have a tendency to revert toward the common level. Extra fine ewes will not produce lambs as good as themselves unless great care is taken in the selection of the ram. We speak of this tendency as regression. From the mating mentioned above there might be a few individual sheep which would sell for prices ranging from $50 to

$100. The larger number would sell at from $35 to $50 and several would sell for less than $35, some even selling for mutton prices. The average would probably be a little higher than the cost of production. The average price at which these sheep would sell would, of course, depend on the salesmanship of the owner or breeder.

SHEEP PASTURES

There are pasture combinations other than those given in the table which might be used in sheep production in Western Oregon. Some of these are grain stubble, hay stubble, sown sod, rye for pasture, early spring grazing of hay crops such as clover and vetch, and winter grazing of grain crops. The pasture yields expressed in sheep days per acre of various pastures on the Oregon State Agricultural College farm are given in Table IX.

TABLE IX. PASTURE YIELDS EXPRESSED IN SHEEP DAYS PER ACRE ON OREGON STATE AGRICULTURAL COLLEGE FARM

Pasture	Number of trials	Sheep days per acre Lowest	Highest	Average
Permanent pastures				
Native sod, on rolling hills relatively free of brush, timber, and moss	4	311	407	349
Native sod, on rolling hills having considerable brush and moss	10	180	272	226
Sown sod, English rye-grass, orchard-grass, timothy, redtop and clover	1	-------	-------	786
Sown sod, English rye-grass (first and second season)	2	187	408	333
Sown sod, English rye-grass (first and second season)	1	-------	-------	1256
Volunteer grass in previously cultivated fields	7	187	272	228
Annual or cultivated pastures				
Rape in rows	2	394	1236	815
Clover	6	359	1024	661
Irrigated pastures				
Grass mixtures	4	1517	1841	1673
Winter or spring grazing of hay crops				
Clover and rye-grass hay, early spring grazing	4	40	149	99
Vetch hay, early spring grazing	4	126	253	219
Stubble pasture				
Clover hay stubble	8	47	319	144
Vetch-and-oats stubble	2	42	61	52
Barley stubble	1	-------	-------	88

The columns giving the lowest and highest yield of pasture per acre show that there is considerable variation. In the case of the permanent and stubble pastures this variation is due primarily to seasonal differences. The variations in the annual or cultivated pastures are due not only to seasonal differences but also to soil conditions and crop failures.

Permanent pasture. Native sod and sown sod pastures are classed as permanent pastures. These pastures furnish good feed for sheep during the fall, winter, and spring but are not of much value during the summer months. Native sod is found on land that is unsuited for cultivation. This type of pasture, found on the foot-hills skirting the Willamette Valley, has a low carrying capacity. Usually the soil is thin and will support only annual grasses whose growing season is extremely short. On some of the better native sod there are considerable perennial grasses along with the annuals. The sown sod is usually found on land that is suitable for farm-

ing. Because of the improved varieties of grasses used the carrying capacity of these pastures usually far exceeds that of the native sod. Sown sod pasture comes on earlier in the fall and lasts much longer in the spring than the native sod pasture.

The following pasture mixtures, to be sown at the rate of sixteen pounds per acre, are recommended for Western Oregon lands by the department of Farm Crops:

Well-drained land

English rye-grass	6
Kentucky blue-grass	3
Orchard-grass	3
Tall oat-grass	3
Timothy	2
Redtop	1
Burr clover	3
White or Ladino clover	1
Total	22

Wet or heavy land

English rye-grass	8
Redtop	3
Orchard-grass	3
Alsike clover	2
White clover	1
Total	17

Table IX reports a yield of 786 sheep days per acre for a mixture of English rye-grass, orchard-grass, timothy, redtop, and clover. This yield was for one year only during the early life of the pasture. The pasture now is twelve years old and is still good, but is on good land and has been well manured. In a series of two trials, English rye-grass sod yielded 408 sheep days per acre the first year and 257 sheep days the second year, or an average of 333 sheep days for the two years, which really is not high enough. In another trial English rye-grass sod yielded 1256 sheep days per acre for the first year. The second year's data on this area have not yet been gathered. This pasture will in all probability average from 600 to 800 sheep days. Sown sod pastures tend to yield less from year to year as the better grass plants die off and are replaced with less valuable grasses. Sown sod pastures should from time to time receive a top dressing of new seed. Permanent sod pastures should not be overstocked since their production is naturally lessened and the danger of internal parasites increased.

Cultivated fields that are allowed to go to volunteer grass do not yield a great amount of pasture, usually about the same as native sod. Such fields would yield from two to four times as much pasture if properly seeded to a suitable grass mixture.

Annual or cultivated. Rape, clover, and rape and clover are the principal crops used for annual or cultivated pastures. The yield of these pastures is the largest of our unirrigated pastures, often running as high as 1,000 sheep days or more per acre. These crops are subject to crop failure, however, and at times are great disappointments. The great advantage in the use of these pasture crops is the high yield of excellent pasture at the time of the year when other green feed is very scarce. The use of these pastures also aids materially in combating internal parasites.

The cost of these pastures is rather high owing to the cost of cultivation and seeding. In spite of cost, however, the use of some form of rape or clover for July and August is necessary in the production of pure-bred sheep that are to be sold as yearlings.

Irrigated pastures. Our work with irrigated pastures has been confined to irrigated sod. Our seedings are new and these pastures have not yet come into full bearing. The four areas tested yielded an average of 1032 sheep days per acre in 1926, 1673 sheep days per acre in 1927, and 1916 sheep days per acre in 1928. These pastures will continue to improve as all the varieties of grass become established. When in full bearing these pastures will in all probability yield considerably more than 2,000 sheep days per acre. The value of these irrigated pastures lies in the fact that they yield liberally of a highly nutritious pasture during the months of July and August when other pastures fail. These pastures are excellent for lambs after weaning.

Fig. 15. The carrying capacity of native sod is materially lowered by the presence of Scotch broom, fern, and moss.

Rotation pastures. The introduction of one or more years of sheep pasture into a long-time rotation is often quite desirable. Most of the domestic grasses and legumes available in Western Oregon are good for one to three years and then deteriorate rapidly. Plowing up these pastures at the end of this time not only affords opportunity for reseeding, but owing to the accumulation of fertility may provide opportunity for one or more years of profitable grain or other cash crops. A most common and at the same time the most effective way of seeding a rotation pasture is to sow rape and clover in May or June and broadcast a grass mixture the following September. The grass will be seeded at the time when the rape

is being pastured, but that is an advantage rather than an objection. The next year the crop will be largely clover and will probably be used for hay purposes. In the following years, the clover will partly disappear and the grass will take its place. At the end of three or four years the grass will be plowed up and put into grain or other crops. The remaining years of the rotation will depend on various local conditions and the preference of the operator. There are but very few sheep farms in Western Oregon that would not profit by introducing into their rotation the rape, clover, and grass combination described above. Frequently the rape and clover without grass is used as a part of the rotation, but the introduction of grass lengthens the time that the land may stand without plowing and guarantees a crop in case the clover should fail. Grass seeded as indicated is a very sure crop, while clover is not too dependable under any circumstances.

Spring grazing of hay and grain crops. The winter and early spring grazing of hay and grain crops can be practiced on the better yielding types of land. This practice gives a very good pasture at a small cost, but care must be used not to graze these crops too heavily as this lowers the subsequent yield. In our grazing work we have taken from 126 to 253 sheep days early spring pasture per acre on vetch. In these trials 253 sheep days grazing per acre reduced the yield of hay eight pounds for each sheep day of pasture and consequently proved to be expensive pasture. The 126 sheep days of grazing did not reduce the yield of hay at all and did improve greatly the quality of hay produced. These trials were with vetch yielding from three to four tons per acre when not grazed. On fair land it would seem safe to graze from 100 to 125 sheep days per acre in the early spring on either vetch or clover hay crops. A minor advantage of spring grazing of these crops is that it usually postpones the hay harvest about one to two weeks, which because of climatic conditions is a distinct advantage some years.

We have done no work on the winter grazing of grain crops and so have no data to offer. This practice has been used by some of our successful sheep farmers in Western Oregon for years. In connection with winter and spring grazing of hay and grain crops, it must be remembered that the system can be used only on the better grades of land. Under no circumstances should the grazing be excessive. During the winter fall-sown crops store considerable food material that is later used in maturing the crop. Because of this, heavy pasturing of these crops materially lowers the subsequent yield and becomes very expensive pasture. The farmer must use considerable judgment as to the time and amount of pasture he can take. This varies considerably with the land and climatic conditions.

Stubble pasture. After crops such as hay and grain have been removed from the field there is still much feed left which can be salvaged only by pasturing with cattle and sheep. The feed in these fields consists of new growth of the crop harvested, volunteer growth of grasses and weeds, and grass and weeds in the fence rows. The amount of pasture obtainable on these lands depends entirely on the season and the crop harvested. Of the crops tested at the Corvallis Station, clover stubble yielded the largest number of days pasture, and vetch and oats the least. The range of pasture for clover was from 47 sheep days, during an extremely dry season, to 319 sheep days for a wet season. With clover stubble one can usually depend

on from 100 to 150 sheep days per acre. Clover stubble is very well suited to sheep of all kinds including growing stock. Vetch and oat stubble and grain stubble are not as good for sheep. Mature sheep make the best use of these pastures as they are absolutely unsuited for young stock. These last-named pastures are really better suited for cattle than for sheep.